PROTOCOL OF MULTI-SITE STUDY FOCUSING ON PER-AND POLYFLUOROALKYL SUBSTANCES QUANTIFICATION, FATE, AND TRANSPORT PROCESSES.

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Per- and polyfluoroalkyl substances (PFAS) ubiquity in wildlife, humans and the global environment urges for robust and reliable methods for risk assessment. A field protocol was stablished to determine the relevance of PFAS fate, transport, and accumulation across multiple sites in North Carolina (NC). The study proposed here will characterize soil and agriculture practices and their relation to PFAS spatial distribution. Data acquisition and materials collected will allow subsequent studies to test organic amendments as a mitigation strategy. The field sampling of Phase 1 was concluded on August 30. Eighteen Research Stations and seven State Parks were selected. The points provided significant variation in terms of soil characteristics and landscape, allowing us to cover NC three main soil regions: Coastal Plain, Piedmont and Mountains. In each location, a toposequence including soil, sediment, and water was collected. Soil cores were acquired using a slide hammer sampler, with a plated soil probe. In each field, triplicates of 6 samples were collected every 20 feet. Total 18 soil cores per field, 32 per location. At Research Stations, agricultural and nonagricultural soils were collected and soils from dense forest and open areas at State Parks. Notes describing the type of crop, crop stage, vegetation and water bodies were taken. Water bodies were separated as input (when it's used for irrigation), output (when it's an agricultural drainage) and dual (ditch that can be used as an agricultural drainage and temporary reservoir for irrigation). This project final goal is to protect public health while promoting agriculture.

Keywords: *Agriculture, Environmental contamination, Exposure, PFAS, Study design.*

REFERENCES

Abou-Khalil, C., Kewalramani, J., Zhang, Z., Sarkar, D., Abrams, S., & Boufadel, M. C. (2023). Effect of clay content on the mobilization efficiency of per- and polyfluoroalkyl substances (PFAS) from soils by electrokinetics and hydraulic flushing. Environ Pollut, 322, 121160. doi:10.1016/j.envpol.2023.121160

Adu, O., Ma, X., & Sharma, V. K. (2023). Bioavailability, phytotoxicity and plant uptake of per- and polyfluoroalkyl substances (PFAS): A review. J Hazard Mater, 447, 130805. doi:10.1016/j.jhazmat.2023.130805

Altarawneh, M., Almatarneh, M. H., & Dlugogorski, B. Z. (2022). Thermal decomposition of perfluorinated carboxylic acids: Kinetic model and theoretical requirements for PFAS incineration. Chemosphere, 286(Pt 2), 131685. doi:10.1016/j.chemosphere.2021.131685

Ambaye, T. G., Vaccari, M., Prasad, S., & Rtimi, S. (2022). Recent progress and challenges on the removal of per- and poly-fluoroalkyl substances (PFAS) from contaminated soil and water. Environ Sci Pollut Res Int, 29(39), 58405-58428. doi:10.1007/s11356-022-21513-2

Berg, V., Sandanger, T. M., Hanssen, L., Rylander, C., & Nøst, T. H. (2021). Time trends of perfluoroalkyl substances in blood in 30-year old Norwegian men and women in the period 1986-2007. Environ Sci Pollut Res Int, 28(32), 43897-43907. doi:10.1007/s11356-021-13809-6

Bonato, M., Corrà, F., Bellio, M., Guidolin, L., Tallandini, L., Irato, P., & Santovito, G. (2020). PFAS Environmental Pollution and Antioxidant Responses: An Overview of the Impact on Human Field. Int J Environ Res Public Health, 17(21). doi:10.3390/ijerph17218020

Brusseau, M. L., Anderson, R. H., & Guo, B. (2020). PFAS concentrations in soils: Background levels versus contaminated sites. Sci Total Environ, 740, 140017. doi:10.1016/j.scitotenv.2020.140017

Daniels, R.B., Buol, S.W., Kleiss, H.J., Ditzler, C.A., 1999. Soil systems in North Carolina. North Carolina State University, Technical Bullettin 314. NCSU . Raleigh

Ehsan, M. N., Riza, M., Pervez, M. N., Khyum, M. M. O., Liang, Y., & Naddeo, V. (2023). Environmental and health impacts of PFAS: Sources, distribution and sustainable management in North Carolina (USA). Sci Total Environ, 878, 163123. doi:10.1016/j.scitotenv.2023.163123

EWG, 2020. PFAS contamination of drinking water far more prevalent than previously reported. Available from: https://www.ewg.org/research/national-pfas-testing.

Ghisi, R., Vamerali, T., & Manzetti, S. (2019). Accumulation of perfluorinated alkyl substances (PFAS) in agricultural plants: A review. Environ Res, 169, 326-341. doi:10.1016/j.envres.2018.10.023